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# Impact of Lighting Technologies on Beef Steaks from the Semimembranosus; a Color Stable Muscle

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## Objectives

Consumer beef purchasing decisions are heavily influenced by color, which is used as an indicator of fresh meat quality in a retail setting. The objectives of this study were to evaluate the impact of different light sources on surface color and lipid oxidation of fresh beef steaks from the *Semimembranosus* (SM; beef muscle with high oxidative and color stabilities) over retail display time.

## Materials and Methods

Steaks from the SM ($n$ = 20) were packaged on Styrofoam trays and overwrapped with oxygen permeable polyvinyl chloride. Steaks were then assigned to 1 of 3 lighting treatments (High UV fluorescent [HFLO], low UV fluorescent [FLO], and light emitting diode [LED]) within temperature controlled deli cases between 2 to 3°C. Steaks were removed on retail display d 1, 3, 5, and 7 for objective color determination, myoglobin concentrations, metmyoglobin reducing abilities, and lipid oxidation levels. Objective color ($L$*, $a$*, and $b$*) values were determined utilizing a Hunter MiniScan. Following objective color determination, relative proportions of myoglobin redox forms on the surface were determined as a measure of myoglobin oxidation. Total myoglobin concentration and metmyoglobin reducing activity (MRA) assays were performed on fresh meat samples. In addition, lipid oxidation was determined by quantification of thiobarbituric acid reactive substances (TBARS). Statistical anaylsis was analyzed using the GLIMMIX function of SAS (SAS Inst. Inc., Cary, NC).

## Results

Redness, as indicated by $a$* values differed ($P$ < 0.05) for steaks treated with all light sources, with HFLO > FLO > LED. The a* values decreased ($P$ < 0.05) over retail display days. These data indicated that HFLO treated steaks retained greater amounts of redness compared FLO and LED treated steaks and that loss of redness occurs over retail display. Steaks treated with both HFLO and FLO light sources had greater ($P$ < 0.05) surface oxymyoglobin ($MbO_2$) contents than those treated with LED lights, indicating that LED treated steaks exhibited a less desirable color than its HFLO and FLO counterparts. Values for MbO2 were lower ($P$ < 0.05) on d 7 of retail display indicating that steaks produced from the SM discolored as retail display time increased. Metmyoglobin (MMb) content increased over retail display with LED treated steaks having greater ($P$ < 0.05) amounts of MMb than steaks treated with HFLO and FLO light sources. By d 7 of retail display, HFLO treated steaks had less ($P$ < 0.05) MMb than both FLO and LED treated steaks. Light source did not influence lipid oxidation in SM steaks. On the other hand, TBARS increased ($P$ < 0.05) daily during the retail display indicating that increased retail display time increases lipid oxidation.

## Conclusion

The findings suggested that the use of HFLO bulbs for retail display of SM steaks increases the bright red color retention compared to FLO and LED lighting.

 